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Appendix A

Recommended course schedule for the combined part-time master's degree study in Applied Automation starting studies in the winter semester

Please note: The German version of this document is the legally binding version. The English translation provided here is for information purposes only.

| First semester | ECTS | SCH | L | ST | E | Ρ | Classroom teaching |
|--|------|-----|----|----|----|---|-----------------------|
| Digital Signal Processing and Controls | 6 | 4 | 2 | - | 1 | 1 | 24 |
| Distributed Automation Systems | 6 | 4 | 2 | - | 1 | 1 | 24 |
| Intellectual Property and Competition Law | 6 | 4 | 2 | - | 2 | - | 16 |
| Technology and Innovation Management | 6 | 4 | 2 | - | 2 | - | 16 |
| Totals | 24 | 16 | 8 | - | 6 | 2 | 80 |
| | | | | | | | |
| Second semester | ECTS | SCH | L | ST | E | Ρ | Classroom teaching |
| Drive Systems and Drive Controls | 6 | 4 | 2 | - | 1 | 1 | 24 |
| Modelling and Simulation of Dynamic Systems | 6 | 4 | 2 | - | 2 | - | 16 |
| Embedded Systems and Software Engineering | 6 | 4 | 2 | - | 2 | - | 16 |
| Industrial Bus Technology and Communication | 6 | 4 | 2 | - | 1 | 1 | 24 |
| Totals | 24 | 16 | 8 | - | 6 | 2 | 80 |
| | | | | | | | |
| Third semester | ECTS | SCH | L | ST | E | Ρ | Classroom teaching |
| Handling Technology and Robotics | 6 | 4 | 2 | - | 1 | 1 | 24 |
| Image-Based Automation Technology | 6 | 4 | 2 | - | 1 | 1 | 24 |
| Data Management / Big Data Analytics | 6 | 4 | 2 | - | 2 | - | 16 |
| Totals | 18 | 12 | 6 | - | 4 | 2 | 64 |
| | | | | | | | |
| Fourth semester | ECTS | SCH | L | ST | E | Ρ | Classroom teaching |
| Master Thesis | 20 | - | - | - | - | - | - |
| Colloquium | 4 | - | - | - | - | - | - |
| Totals | 24 | - | - | - | - | - | - |
| Totals | 90 | 44 | 22 | - | 16 | 6 | 224 |

Legend:

| L | = 100% study | + 0% classroom |
|----------|-----------------------|------------------|
| | materials | teaching |
| ST and E | = 50% study materials | + 50% classroom |
| | - | teaching |
| Р | = 0% study materials | + 100% classroom |
| | _ | teaching |

Appendix B

Module Catalogue

for the master's degree study programme in Applied Automation (part-time combined studies) of the Faculty of Engineering and Mathematics

Please note: The German version of this document is the legally binding version. The English translation provided here is for information purposes only.

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| | e Systems | and Driv | e Contro | ls | | | | | | AA | | |
|-----------------------|---|---|--|---|--|----------------------------------|-----------------------|-----------------|----------------------------|------------|-------------|--|
| Ident numl | ification per: | Worklo | ad: | Credits: | Study | semeste | er: | Frequency offer | of the | Durati | ion: | |
| 5005 | | 150 | | 6 | 2nd or | 2nd or 3rd sem. | | | annual summer semester | | 1 sem. | |
| 1 | Course: | <u> </u> | P | anned group | sizes | Scope | | | ntact time / n teaching | Self-stu | ıdy | |
| | Lecture | | 60 |) students | | 2 | SCH | 0 | h | 75 | h | |
| | | n seminars | 30 |) students | | 0 | SCH | 0 | h | 0 | h | |
| | | | _ | | | - | | - | | - | | |
| | Exercise | | 20 |) students | | 1 | SCH | 8 | h | 51 | h | |
| | Practical | or semina | r 1: | 5 students | | 1 | SCH | 16 | h | 0 | h | |
| | Supervise | ed self-stu | dy 60 |) students | | 0 | SCH | 0 | h | 0 | h | |
| 2 | Learning | outcomes | /competer | nces: | | | | | I | | L | |
| | control. In | n small gr | oups, the | electrical mac students gain or using stanc | initial exp | erience i | in the de | sign and im | plementation | n of a cur | rent contro | |
| 3 | Contents: | | | | | | | | | | | |
| | 1.1. Syr 1.2. Asy 2. Contro | ol models nchronous ynchronou ol models | | 2 | | | | | | | | |
| | 2.1. Pul 2.2. Reg 2.3. Dea 3. Contro 3.1. Fie 3.2. Opt (Interior I 4. Contro 4.1. Fie 4.2. Dir | ld-oriente erating po Permanent ol method ld-oriente ect torque | nodulation pling r digital co for conve d control int selecti t Magnet S for conve d control | n ontrols orter-fed syncl on for SPMSJ Synchronous orter-fed async | M (Surface Motor) | e Permai | | gnet Synchr | onous Motor |) and IPI | MSM | |
| 4 | 2.1. Pul 2.2. Reg 2.3. Dea 3. Contro 3.1. Fie 3.2. Opt (Interior I 4. Contro 4.1. Fie 4.2. Dir Forms of | se width r gular Sam ad time fo ol method ld-oriente erating po Permanent ol method ld-oriente ect torque teaching: | nodulation pling r digital co for conve d control int selecti t Magnet S for conve d control control (1 | n ontrols orter-fed syncl on for SPMSJ Synchronous orter-fed async | M (Surface Motor) chronous r | e Perman | 5 | | |) and IPI | MSM | |
| | 2.1. Pul 2.2. Reg 2.3. Dea 3. Control 3.1. Fie 3.2. Opticity (Interior I 4. Control 4.1. Fie 4.2. Dir Forms of Learning Participat | se width r gular Sam ad time fo ol method ld-oriente erating po Permanent ol method ld-oriente ect torque teaching: | nodulation pling r digital co for convect d control int selecti t Magnet S for convect d control control (1) self-study, | n ontrols on for SPMS Synchronous orter-fed async DTC) | M (Surface Motor) chronous r | e Perman | 5 | | |) and IPI | MSM | |
| | 2.1. Pul 2.2. Reg 2.3. Dea 3. Control 3.1. Fiel 3.2. Operative (Interior H 4. Control 4.1. Fiel 4.2. Dir Forms of Learning Participat Formal: | se width r gular Sam ad time fo ol method ld-oriented erating po Permanent ol method ld-oriented ect torque teaching: units for s | nodulation pling r digital co for convect d control int selecti t Magnet S for convect d control control (1) self-study, | n ontrols on for SPMS Synchronous orter-fed async DTC) | M (Surface Motor) chronous r | e Perman | 5 | | |) and IP | MSM | |
| 5 | 2.1. Pul 2.2. Reg 2.3. Dea 3. Control 3.1. Fie 3.2. Ope (Interior I 4. Control 4.1. Fie 4.2. Dir Forms of Learning Participat Formal: Content: | se width r gular Sam ad time fo ol method ld-oriented erating po Permanent ol method ld-oriented ect torque teaching: units for s | nodulation pling r digital co for conve d control int selecti t Magnet S for conve d control control (1 self-study, ements: - | n ontrols on for SPMS Synchronous orter-fed async DTC) | M (Surface Motor) chronous r | e Perman | 5 | | | and IPI | MSM | |
| 5 | 2.1. Pul 2.2. Reg 2.3. Dea 3. Control 3.1. Fie 3.2. Ope (Interior I 4. Control 4.1. Fie 4.2. Dir Forms of Learning Participat Formal: Content: Forms of | se width r gular Sam ad time fo ol method ld-oriente erating po Permanent ol method ld-oriente ect torque teaching: units for s | nodulation pling r digital co for conve d control int selecti t Magnet S for conve d control (1 self-study, ements: - - nt: | n ontrols orter-fed syncl on for SPMSI Synchronous orter-fed async DTC) classroom ev | M (Surface Motor) chronous r | e Perman | 5 | | | •) and IPI | MSM | |
| 5 | 2.1. Pul 2.2. Reg 2.3. Dea 3. Control 3.1. Fie 3.2. Ope (Interior I 4. Control 4.1. Fie 4.2. Dir Forms of Learning Participate Formal: Content: Forms of Written e | se width r gular Sam ad time fo ol method ld-orienter erating po Permanent ol method ld-orienter ect torque teaching: units for s ion requir assessmen xaminatio | nodulation pling r digital co for conve d control int selecti t Magnet S for conve d control (1 self-study, ements: - - nt: n or oral e | n ontrols erter-fed syncl Synchronous erter-fed async DTC) classroom ev | M (Surface Motor) chronous r /ents in the | e Perman | 5 | | |) and IP | MSM | |
| 5 | 2.1. Pul 2.2. Reg 2.3. Dea 3. Control 3.1. Fie 3.2. Ope (Interior I 4. Control 4. Control 4.2. Dir Forms of Learning Participat Formal: Content: Forms of Written e Prerequise | se width r gular Sam ad time fo ol method ld-orienter erating po Permanent ol method ld-orienter ect torque teaching: units for s ion requir assessmen xaminatio ite for the | nodulation pling r digital cu for conve d control int selecti t Magnet S for conve d control (1 self-study, ements: - - nt: n or oral e award of | n ontrols erter-fed syncl Synchronous erter-fed async DTC) classroom ev examination credit points: | M (Surface Motor) chronous r /ents in the | e Perman | 5 | | |) and IP | MSM | |
| 5 6 7 | 2.1. Pul 2.2. Reg 2.3. Dea 3. Control 3.1. Fie 3.2. Ope (Interior I 4. Control 4. Control 4.2. Dir Forms of Learning Participat Formal: Content: Forms of Written e Prerequis Module e | se width r gular Sam ad time fo ol method ld-orienter erating po Permanent ol method ld-orienter ect torque teaching: units for s ion requir assessmen xaminatio ite for the xaminatio | nodulation pling r digital cu for conve d control int selecti t Magnet S for conve d control control (1 self-study, ements: - - nt: n or oral e award of m pass and | n ontrols erter-fed syncl Synchronous erter-fed async DTC) classroom ev | M (Surface Motor) chronous r /ents in the ssment | • Perman machines • form o | s f exercis | | | and IPI | MSM | |
| 5 6 7 | 2.1. Pul 2.2. Reg 2.3. Dea 3. Contro 3.1. Fie 3.2. Opticipate 4. Contro Forms of Learning Participate Formal: Content: Forms of Written experience Prerequise Module e Application Applied A | se width r gular Sam ad time fo ol method ld-oriented erating po Permanent ol method ld-oriented ect torque teaching: units for s ion requir assessmen <u>xaminatio</u> ite for the <u>xaminatio</u> on of the r | nodulation pling r digital co for convect d control int selecti t Magnet S for convect d control (1 control (1) control (1) contro | n ontrols erter-fed syncl Synchronous erter-fed async DTC) classroom ev classroom ev credit points: d course asses n the followin ne combined | M (Surface Motor) chronous r /ents in the ssment g study pro | e Perman nachines form or | s f exercis es) | es and pract | | | | |
| 4 5 7 8 9 | 2.1. Pul 2.2. Reg 2.3. Dea 3. Contro 3.1. Fie 3.2. Opticity (Interior I 4. Contro 4. Contro 4.1. Fie 4.2. Dir Forms of Learning Participat Formal: Content: Forms of Written e: Prerequis Module e Application Applied A (part-time | se width r gular Sam ad time fo ol method ld-orienter erating po Permanent ol method ld-orienter ect torque teaching: units for s ion requir assessmen xaminatio ite for the xaminatio on of the r Automatio | nodulation pling r digital co for convect d control int selecti t Magnet S for convect d control control (1) self-study, ements: - - nt: n or oral e award of n pass and module (in n (part-tin d studies) | n ontrols erter-fed syncl Synchronous orter-fed async DTC) classroom ev classroom ev credit points: d course asses n the followin | M (Surface Motor) chronous r /ents in the ssment g study prostudies) (N | e Perman nachines form or | s f exercis es) | es and pract | | | | |

| 10 | Module Coordinator: |
|----|-------------------------|
| | Prof. Dr. Michael Leuer |
| 11 | Other information: |
| | - |

| | e-Based A | utomation Te | echnology | | | | | | BAT | | | |
|----------------|--|---|---|--|--------------------|-----------|----------------------|-----------------------------|------------|------|--|--|
| Identi numb | ification er: | Workload: | Credits: | Study | semeste | er: | Frequency offer | of the | Duration: | | | |
| 5010 | | 150 | 6 | 1st, 2 | nd or 3rd | l sem. | annual winter sem | nester | 1 sem. | | | |
| 1 | Course: | | Planned group s | sizes | Scope | | | ontact time / m teaching | Self-stu | ıdy | | |
| | Lecture | | 60 students | 2 | SCH | 0 | h | 75 | h | | | |
| | Tuition in seminars | | 30 students | | 0 | SCH | 0 | h | 0 | h | | |
| | Exercise | | 20 students | | 1 | SCH | 8 | h | 51 | h | | |
| | Practical | or seminar | 15 students | | 1 | SCH | 16 | h | 0 | h | | |
| | Supervise | ed self-study | 60 students | | 0 | SCH | 0 | h | 0 | h | | |
| 2 | Learning | outcomes/com | petences: | | 1 | | _ | ļ] | | I | | |
| | explain the basic concepts of imaging systems for use as sensors in automation. select the appropriate imaging systems for different questions. assess the usability of the systems in the respective environment. independently solve problems from the field of imaging automation by selecting concepts, among others. demonstrate basic knowledge of the programming of typical industrially used in systems and distinguish between them. | | | | | | | selecting so | | | | |
| 3 | Sensor ty 2- and 3-c Lighting Presentati Basics of | optical basics o pes for automat dimensional dat concepts (struct ion of the differ coding (creation | f imaging sensor te tion ta acquisition for at ture, wavelength) rent areas of applic on, reading, verifica mation according to | utomation ation (me ation) | n easuring, | - | characterisa | tion, etc.) | | | | |
| 4 | Forms of Learning | 0 | udy, classroom eve | ents in th | e form o | f exercis | ses with proj | ect tasks and | d internsl | nips | | |
| 5 | Participat Formal: | ion requiremen | ts: | | | | | | | | | |
| | | | | | | | | | | | | |
| | Content: - Forms of assessment: | | | | | | | | | | | |
| 6 | Forms of | assessment. | | | | | tion | | | | | |
| 6 | | | ion or performance | e or comb | ination e | examına | | | | | | |
| 6 7 | Written o | r oral examinat | ion or performance d of credit points: | e or comb | oination e | examina | | | | | | |
| | Written o Prerequis Module e | r oral examinat ite for the awar xamination pas | d of credit points: s and course assess | sment | | | | | | | | |
| | Written o Prerequis Module e Applicatio | r oral examinat ite for the awar xamination pas on of the modu | d of credit points: s and course assess le (in the following | sment g study pi | ogramm | es) | | | | | | |
| 7 | Written o Prerequis Module e Applicati Applied A Important | r oral examinat ite for the awar xamination pas on of the modu Automation (pa ce of the grade | d of credit points: s and course assess | sment g study pr tudies) (I | ogramm M.Eng.); | es) | | • MA §32 | | | | |
| 7 8 | Written o Prerequis Module e Applicati Applied A Important percentag | r oral examinat ite for the awar xamination pas on of the modu Automation (pa ce of the grade the based on the Coordinator: | d of credit points: s and course assess le (in the following rt-time combined s for the final grade: sum of credits of th | sment g study pr tudies) (I he graded | ogramm M.Eng.); | es) | | • MA §32 | | | | |
| 7 8 9 | Written o Prerequis Module e Applicati Applied A Important percentag | r oral examinat ite for the awar xamination pas on of the modu Automation (pa ce of the grade ce based on the Coordinator: rer. nat. Marc-O | d of credit points: s and course assess le (in the following rt-time combined s for the final grade: | sment g study pr tudies) (I he graded | ogramm M.Eng.); | es) | | • MA §32 | | | | |

| | Managem | ent / Big Data | a Analytics | | | | | | BDA | |
|---------------|--|--|---|---|--|---|-------------------------------------|---------------|-------------|-----------|
| ldent 1umb | ification | Workload: | Credits: | Study | semeste | er: | Frequency offer | of the | Durati | ion: |
| 5011 | | 150 | 6 | 1st, 2 | nd or 3rd | d sem. | each seme | ster | 1 sem | |
| 1 | Course: | | Planned group s | Planned group sizes Sc | | | actual co time / cla teaching | assroom | Self-study | |
| | Lecture | | 60 students | | 2 | SCH | 0 | h | 75 | h |
| | | n seminars | 30 students | | 0 | SCH | 0 | h | 0 | h |
| | Exercise | | 20 students | | 2 | SCH | 16 | h | 59 | h |
| | Practical | or seminar | 15 students | | 0 | SCH | 0 | h | 0 | h |
| | Supervise | ed self-study | 60 students | | 0 | SCH | 0 | h | 0 | h |
| 3 | The stude Students a Students a of method Students a Contents: Introducti | are able to acce will be able to o are able to analy ds from the field will be able to u | oasic handling of N ss internal and exter lescribe numerical yse large amounts d of statistics and r inderstand the basi | ernal data data by s of data bo nachine lo ic procedu | sources tatistical oth in a t earning a ire for as | l parame argeted at their d nalysing | and explorat lisposal. | tory way, w | ith a dive | rse range |
| | Opening u Basics of Basics of Correlatio Time seri Basics of Pre-proce Unsuperv Supervise Supervise | descriptive stat on analysis and es analysis machine learni essing of data (e rised learning I: Clead learning II: L | with Python (which istics Visualisation regression .g. dimension redu e.g. clustering) lassification (e.g. v earning of arbitrar | h is used i n of data uction) via suppor ry input-o | n the ex | ercises f machine | es) | | | orks) |
| 4 | Opening u Basics of Basics of Correlatio Time seri Basics of Pre-proce Unsuperv Supervise Supervise Entry into | up data sources programming v descriptive stat on analysis and es analysis machine learni essing of data (e vised learning (e ed learning I: Cl ed learning II: L o large-scale dat teaching: | with Python (which istics Visualisation regression ng .g. dimension redu 2.g. clustering) lassification (e.g. v | h is used i n of data uction) via suppor ry input-o adoop | n the ex t vector utput co. | ercises f machine rrelation | es) s (e.g. with | | | orks) |
| | Opening u Basics of Basics of Correlation Time seri Basics of Pre-proce Unsuperv Supervise Supervise Entry into Forms of Learning Participat Formal: | up data sources programming v descriptive stat on analysis and es analysis machine learni essing of data (e vised learning (e ed learning I: Cl ed learning II: L o large-scale dat teaching: | with Python (which istics Visualisation regression .g. .g. dimension redu e.g. clustering) lassification (e.g. v earning of arbitrar ta analysis with Ha | h is used i n of data uction) via suppor ry input-o adoop | n the ex t vector utput co. | ercises f machine rrelation | es) s (e.g. with | | | orks) |
| 5 | Opening u Basics of Basics of Correlatio Time seri Basics of Pre-proce Unsuperv Supervise Supervise Entry into Forms of Learning Participat Formal: Content: Forms of | up data sources programming v descriptive stat on analysis and es analysis machine learni essing of data (e ised learning I: Cled learning II: L o large-scale dat teaching: units for self-st ion requiremen - assessment: | with Python (which istics Visualisation regression .g .g. dimension redu e.g. clustering) lassification (e.g. v earning of arbitrar ta analysis with Ha udy, classroom ses ts: | h is used i n of data uction) via suppor ry input-o adoop | n the ex t vector utput co. | ercises f machine rrelation | es) s (e.g. with | | | orks) |
| 5 | Opening u Basics of Basics of Correlatio Time seri Basics of Pre-proce Unsuperv Supervise Supervise Entry into Forms of Learning Participat Formal: Content: Forms of Written e | up data sources programming v descriptive stat on analysis and es analysis machine learni essing of data (e ised learning I: Clead learning II: Clead learning II: Clead learning II: Clead learning II: L to large-scale dat teaching: units for self-st ion requiremen - - assessment: xamination or clead | with Python (which istics Visualisation regression ng .g. dimension redu .g. clustering) lassification (e.g. v .earning of arbitrar ta analysis with Ha udy, classroom ses ts: | h is used i n of data uction) via suppor ry input-o adoop | n the ex t vector utput co. | ercises f machine rrelation | es) s (e.g. with | | | orks) |
| 5 | Opening u Basics of Basics of Correlatio Time seri Basics of Pre-proce Unsuperv Supervise Supervise Entry into Forms of Learning Participat Formal: Content: Forms of Written e Prerequis | up data sources programming v descriptive stat on analysis and es analysis machine learni essing of data (e rised learning fi ed learning I: C ed learning II: C ed learning I | with Python (which istics Visualisation regression ng .g. dimension redu .g. clustering) lassification (e.g. v .earning of arbitrar ta analysis with Ha udy, classroom ses ts: vral examination d of credit points: | h is used i n of data uction) via suppor ry input-o adoop | n the ex t vector utput co. | ercises f machine rrelation | es) s (e.g. with | | | orks) |
| 4 5 6 7 8 | Opening u Basics of Basics of Correlatio Time seri Basics of Pre-proce Unsuperv Supervise Supervise Entry into Forms of Learning Participat Formal: Content: Forms of Written e Prerequis Module e | up data sources programming v descriptive stat on analysis and es analysis machine learni essing of data (e ised learning fi cl ed learning II: L o large-scale dat teaching: units for self-st ion requiremen | with Python (which istics Visualisation regression .g. .g. dimension redu .g. clustering) lassification (e.g. v .earning of arbitrar ta analysis with Ha udy, classroom ses ts: | h is used i n of data action) /ia suppor ry input-o adoop | n the ex t vector utput co | ercises f machine rrelation | es) s (e.g. with | | | orks) |
| 5 | Opening of Basics of Basics of Correlatio Time seri Basics of Pre-proce Unsuperv Supervise Supervise Entry into Forms of Learning Participat Formal: Content: Forms of Written e Prerequis Module e Applicatio | up data sources programming v descriptive stat on analysis and es analysis machine learni essing of data (e rised learning I: Cl ed learning II: Cl ed learning II: Cl ed learning II: L o large-scale dat teaching: units for self-st ion requiremen | with Python (which istics Visualisation regression .g. dimension redu e.g. clustering) lassification (e.g. v earning of arbitrar ta analysis with Ha udy, classroom ses ts: | h is used i n of data action) via suppor ry input-o adoop ssions in t | n the ex t vector utput co. | ercises f machine rrelation | es) s (e.g. with cises | artificial ne | eural netwo | |

| | Prof. DrIng. Wolfram Schenck |
|----|------------------------------|
| 11 | Other information: |
| | - |

| Image: Second state in the second state second state second state in the second state in the second sta | Digit | al Signal I | Processing and | d Controls | | | | | | DSR | | | |
|---|-------|---|--|--|---|---|--|--|---|---|--|--|--|
| 5006 150 6 1st, 2nd or 3rd sem. mmual winter semester 1 sem. 1 Course: Planned group sizes Scope Actual contact time Self-study 1 Lecture 60 students 2 SCH 0 h 75 h 1 Stringen 20 students 1 SCH 0 h 0 h 1 Stringen 20 students 1 SCH 8 h 51 h 1 Supervised self-study 60 students 1 SCH 8 h 0 h 0 h 0 h n n h n h n h n h n h n h n h n h n h n h n h n h n h n h n h n h n h n h n h h <td></td> <td></td> <td>Workload:</td> <td>Credits:</td> <td>Study</td> <td>semeste</td> <td>er:</td> <td></td> <td>of the</td> <td>Durat</td> <td>ion:</td> | | | Workload: | Credits: | Study | semeste | er: | | of the | Durat | ion: | | |
| Lecture 60 students 2 SCH 0 h 75 h Tuition in seminars 30 students 0 SCH 0 h 0 h 0 h <t< td=""><td>5006</td><td></td><td>150</td><td>6</td><td>1st, 2</td><td>nd or 3rd</td><td>l sem.</td><td>annual</td><td>nester</td><td colspan="3"></td></t<> | 5006 | | 150 | 6 | 1st, 2 | nd or 3rd | l sem. | annual | nester | | | | |
| Lecture 60 students 2 SCH 0 h 75 h Tuition in seminars 30 students 0 SCH 0 h 0 h Exercise 20 students 1 SCH 8 h 51 h Practical or seminar 15 students 1 SCH 16 h 0 h Supervised self-study 60 students 0 SCH 0 h 0 h 2 Learning outcomes/competences: After successful completion of the module, students can reproduce basic mathematical knowledge and apply functional transformations for the various forms of representation of discrete signals and systems. They are able to handle and evaluate the basic procedures of digital signal processing (window techniques, filters, correlation,). The students can apply the knowledge from digital signal processing to design and optimise digital control loop and to describe them in the time or frequency domain. 3 Contents: 1. Discrete radiom signals, power demisity, correlation, shot time spectra, power of discrete signals, random signals for order digital filters of time or digital filters (IIR), cascading for the realisation of higher order digital filters. Properties and design of non-recursive digital filters. Bilineat transformation, transfe | 1 | Course: | | Planned group s | izes | Scope | | Actual c | ontact time | Self-stu | ıdy | | |
| Exercise 20 students 1 SCH 8 h 51 h Practical or seminar 15 students 1 SCH 16 h 0 h Supervised self-study 60 students 0 SCH 0 h 0 h 2 Learning outcomes/competences: After successful completion of the module, students can reproduce basic mathematical knowledge and apply functional transformations for the various forms of representation of discrete signals and systems. They are able to handle and evaluate the basic procedures of digital signal processing (window techniques, filters, correlation,). The students can apply the knowledge from digital signal processing to design and optimise digital control loop and to describe them in the time or frequency domain. 3 Contents: I Discrete signals, signal sampling, discrete Fourier transform and Fourier analysis, window functions, fast Fourier transform, discrete convolution. Isoscrete signals, signal sampling, discrete fourier transform and signals. 9 Discrete random signals, power density, correlation, short time spectra, power of discrete signals, random signals, power density, correlation, short time spectra, power of discrete signals, random signals, power density, correlation for thor-distantion, stability of discrete systems, digital filters. 9 Bilmear transformation, transfer function and recursion formulas of digital filte | | Lecture | | 60 students | | 2 | SCH | | - | 75 | h | | |
| Practical or seminar 15 students 1 SCH 16 h 0 h Supervised self-study 60 students 0 SCH 0 h 0 h 2 Learning outcomes/completion of the module, students can reproduce basic mathematical knowledge and apply functional transformations for the various forms of representation of discrete signals and systems. They are able to handle and evaluate the basic procedures of digital signal processing (window techniques, filters, correlation,). The students can apply the knowledge from digital signal processing to design and optimise digital control loop and to describe them in the time or frequency domain. 3 Contents: 1 Discrete signals, signal sampling, discrete Fourier transform and Fourier analysis, window functions, fast Fourier transform, discrete convolution. • Discrete signals, isgnal sampling, discrete Fourier transform and Fourier analysis, window functions, fast Fourier transform and filtering of two-dimensional signals. • Discrete signals, isgnal sampling, discrete fourier transform and z-transfer function, stability of discrete systems, digital filters. • Sampling, discrete Fourier transform and recursion formulas of digital filters (IIR), cascading for the realisation of higher order digital filters. • Bilinear transformation, transfer function, and recursion formulas of digital filters (IIR), cascading for the realisation of higher or | | Tuition in | seminars | 30 students | | 0 | SCH | 0 | h | 0 | h | | |
| Supervised self-study 60 students 0 SCH 0 h 0 h 2 Learning outcomes/competences: After successful completion of the module, students can reproduce basic mathematical knowledge and apply functional transformations for the various forms of representation of discrete signals and systems. They are able to handle and evaluate the basic procedures of digital signal processing (window techniques, filters, correlation,). 3 Contents: 1 Discrete signals, signal sampling, discrete Fourier transform and Fourier analysis, window functions, fast Fourier transform, discrete Fourier transform and Fourier analysis, window functions, fast Fourier transform, discrete rowolution. 9 Discrete random signals, power density, correlation, short time spectra, power of discrete signals, random signals in linear systems, white and coloured noise. 9 Bilinear transformation, transfer functions and recursion formulas of digital filters (IIR), cascading for the realisation of higher order digital filters. 9 Bilinear transformation, transfer function, and parametric clasifiers. 9 Discrete applications, runtime measurement, system identification. Principle of pattern recognition, signal preprocessing, feature extraction, pattern vectors, non-parametric and parametric classifiers. 9 Digital control • Principle structure of digital control loops; sampling process: technical realisation and mathematical description by sample-and-hold elem | | Exercise | | 20 students | | 1 | SCH | 8 | h | 51 | h | | |
| 2 Learning outcomes/competences: After successful completion of the module, students can reproduce basic mathematical knowledge and apply functional transformations for the various forms of representation of discrete signals and systems. They are able to handle and evaluate the basic procedures of digital signal processing (window techniques, filters, correlation,). The students can apply the knowledge from digital signal processing to design and optimise digital control loop and to describe them in the time or frequency domain. 3 Contents: 1. Digital signal processing Discrete random signals, power density, correlation, short time spectra, power of discrete signals, random signals in linear systems, white and coloured noise. Sampling, discrete Fourier transform and filtering of two-dimensional signals. Discrete systems difference equation, z-transform and z-transfer function, stability of discrete systems, digital filters. Bilinear transformation, transfer functions and recursion formulas of digital filters (IR), cascading for the realisation of higher order digital filters. Properties and design of non-recursive digital filters. Selected applications, runtime measurement, system identification. Principle of pattern recognition, signal preprocessing, feature extraction, pattern vectors, non-parametric and parametric classifiers. Digital control Principle structure of digital orthol logs: sampling theorem. Digital filters, too: Reference to analogue filters and frequency response representation Procedure for determining the z-transfer function, analytically (exact and approximate), experimentally. Digital filters, too: Reference to analogue filte | | Practical | or seminar | 15 students | | 1 | SCH | 16 | h | 0 | h | | |
| After successful completion of the module, students can reproduce basic mathematical knowledge and apply functional transformations for the various forms of representation of discrete signals and systems. They are able to handle and evaluate the basic procedures of digital signal processing (window techniques, filters, correlation,). The students can apply the knowledge from digital signal processing to design and optimise digital control loop and to describe them in the time or frequency domain. 3 Contents: 1 Discrete signals, signal sampling, discrete Fourier transform and Fourier analysis, window functions, fast Fourier transform, discrete convolution. • Discrete signals, nower density, correlation, short time spectra, power of discrete signals, random signals, nower systems, white and coloured noise. • Sampling, discrete Fourier transform and filtering of two-dimensional signals. • Discrete systems, difference equation, z-transform and z-transfer function, stability of discrete systems, digital filters. • Bilinear transformation, transfer functions and recursion formulas of digital filters (IRR), cascading for the realisation of higher order digital filters. Properties and design of non-recursive digital filters. • Selected applications, runtime measurement, system identification. Principle of pattern recognition, signal preprocessing, feature extraction, pattern vectors, non-parametric and parametric classifiers. 2. Digital control • Principle structure of digital control loops; sampling process: technical | | Supervise | ed self-study | 60 students | | 0 | SCH | 0 | h | 0 | h | | |
| functions, fast Fourier transform, discrete convolution. Discrete random signals, power density, correlation, short time spectra, power of discrete signals, random signals in linear systems, white and coloured noise. Sampling, discrete Fourier transform and filtering of two-dimensional signals. Discrete systems difference equation, z-transform and z-transfer function, stability of discrete systems, digital filters. Bilinear transformation, transfer functions and recursion formulas of digital filters (IIR), cascading for the realisation of higher order digital filters. Properties and design of non-recursive digital filters (FIR). Selected applications, runtime measurement, system identification. Principle of pattern recognition, signal preprocessing, feature extraction, pattern vectors, non-parametric and parametric classifiers. Digital control Principle structure of digital control loops; sampling process: technical realisation and mathematical description by sample-and-hold element; difference equation z-transform, z-transfer function, discrete convolution; connections between Laplace and z-transform, pole zeros and stability; Shannon's sampling theorem. Digital filters, too: Reference to analogue filters and frequency response representation Procedure for determining the z-transfer function, analytically (exact and approximate), experimentally. Digital control design: digital PID controller, quasi-continuous and discrete design; dead-beat controller, principle of predictive control. Tool-supported design and commissioning of digital controls for an application example (e.g. loading bridge, three-tank system). | 3 | and to describe them in the time or frequency domain. Contents: Digital signal processing Discrete signals, signal sampling, discrete Fourier transform and Fourier analysis, window | | | | | | | | | | | |
| Learning units for self-study, classroom events in the form of exercises and practicals | | 2. Digital | functions, fast H Discrete random random signals Sampling, discr Discrete system systems, digital Bilinear transfo for the realisatio (FIR). Selected applica signal preproce control Principle structu description by s z-transform; pole Digital filters, t Procedure for d experimentally. Digital control controller; princ | Fourier transform, of n signals, power de in linear systems, " ete Fourier transfo as difference equati filters. rmation, transfer fr on of higher order of ations, runtime mea- ssing, feature extra ure of digital contra- ample-and-hold el ransfer function, d zeros and stability oo: Reference to an etermining the z-tr design: digital PID ciple of predictive of design and commi | discrete c ensity, co white and orm and fi ion, z-tran unctions a digital fil asurement action, par ol loops; ement; di iscrete co r; Shanno nalogue f ransfer fu controlle controll issioning | onvoluti rrelation l coloure ltering c asform a and recu ters. Pro tters. Pro ttern vec sampling ifference onvolution n's samp ilters and nction, a | on. , short t ed noise. f two-di nd z-tra rsion for perties a n identifi tors, noi g process e equatic on; conn ling the d freque nalytica -continu | ime spectra, imensional s nsfer function rmulas of di- and design of fication. Prin n-parametric s: technical m ections betworem. ncy response illy (exact ar ous and disc | power of di signals. on, stability of gital filters (f non-recurs aciple of patt c and paramo realisation a veen Laplace e representat ad approxim | screte sig of discret (IIR), cas ive digita tern recog etric class and mathe e and z- tion ate), dead-bes | te cading al filters gnition, sifiers. ematical | | |
| | 4 | | - | udy, classroom eve | ents in the | e form o | f exercis | ses and pract | ticals | | | | |
| | 5 | | | - | | | | pruo | | | | | |

| | Formal: | - |
|----|---------------------|--|
| | Content: | - |
| 6 | Forms of assessm | ent: |
| | Written exam or c | combination exam (term paper with presentation and oral exam) |
| 7 | Prerequisite for th | e award of credit points: |
| | Module examination | ion pass and course assessment |
| 8 | Application of the | e module (in the following study programmes) |
| | Applied Automati | ion (part-time combined studies) (M.Eng.); |
| 9 | Importance of the | grade for the final grade: |
| | Percentage based | on the sum of credits of the graded modules according to RPO- MA §32 |
| 10 | Module Coordina | tor: |
| | Prof. Dr. Michael | Leuer |
| 11 | Other information | : |
| | Required literatur | e (in addition to the basic literature) will be announced each semester. |

| | | and and | 1 SOITW2 | are Engineerin | g | | | | | ESS | | | |
|----------------|---|-------------|-------------------|----------------------------|-------------|-----------------|--------------|------------------------|---------------------------|-------------|------------|--|--|
| ldenti numb | fication er: | Workle | oad: | Credits: | Study | Study semester: | | | of the | Duration: | | | |
| 5001 | | 150 | | 6 | 1st, 2 | nd or 3rd | l sem. | annual summer se | annual summer semester | | 1 sem. | | |
| 1 | Course: | | | Planned group sizes | | Scope | | Actual c time / cla | assroom | Self-stu | ıdy | | |
| | Lecture | | | 60 students | | 2 | SCH | teaching 0 | h | 75 | h | | |
| | | acominar | | 30 students | | 0 | SCH | 0 | h | 0 | h | | |
| | Tuition in seminars | | 5 | 50 students | | 0 | SCII | 0 | 11 | 0 | 11 | | |
| | Exercise | | | 20 students | | 2 | SCH | 16 | h | 59 | h | | |
| | Practical | or semina | ar | 15 students | | 0 | SCH | 0 | h | 0 | h | | |
| · | Supervise | ed self-stu | ıdy | 60 students | | 0 | SCH | 0 | h | 0 | h | | |
| 2 | Learning | outcome | s/compet | ences: | | 1 | | | | | | | |
| | The stude | ents can se | elect and | apply the tools | that suppo | ort the de | sign pro | cess for emb | edded syste | ems for the | e solution | | |
| | of autom | | | | | | | | | | | | |
| | They can analyse given tasks and design suita | | | | | | ystems | for this, crea | te a suitable | e software | concept | | |
| | for it and | select the | e necessa | ry tools and tes | t environi | nents. | | | | | | | |
| | | | | | | | | | | | | | |
| 3 | Contents | | | | | | | | | | | | |
| , | 1. Embed | | ems | | | | | | | | | | |
| | | Definitio | | | | | | | | | | | |
| | | Embedde | | sors | | | | | | | | | |
| | | Periphery | - | 5015 | | | | | | | | | |
| | | Real-time | |)))r | | | | | | | | | |
| | | | | mentation: Boo | ting cros | s-comnil | ing link | cing loading | remote de | huooino | | | |
| | | | | h scarce resourc | | | | | | | 1 | | |
| | | | | i-level language | | ipt progr | ammin | , processor | specific no | ii stundurt | | | |
| | | | | cores kernel: Pi | | nagemer | nt sched | luling proce | ss commur | vication | | | |
| | | hardware | | | 100055 1114 | nagemei | n, seneu | uning, proce | ss commu | neation, | | | |
| | 2. Softwa | | | | | | | | | | | | |
| | | | | models stem development | | | | | | | | | |
| | | | | grams of SysML | | | | | | | | | |
| | | | | ased developm | | | | | | | | | |
| | | | | systems using t | | le of sin | nle med | chatronic ap | olications v | vith the Ra | aspherry | | |
| | erriogra | | novadva | sjotenno using (| ine enang | | .p.o | inun onne upp | , | | aspeenig . | | |
| | Earma of | taashing | | | | | | | | | | | |
| 4 | Forms of | - | | y, classroom se | ssions in t | the form | ofever | rises | | | | | |
| 5 | Participat | | | | 3310113 111 | | or exert | 21303 | | | | | |
| · | Formal: | | - | | | | | | | | | | |
| | Content: | | - | | | | | | | | | | |
| 5 | Forms of | assessme | ent: | | | | | | | | | | |
| ~ | | | | on exam (term p | naner with | nresent | ation an | d oral exam |) | | | | |
| | withen c | | moman | | super with | i present | acion all | a orar chaili, | , | | | | |
| 7 | _ | | | of credit points: | | | | | | | | | |
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| 3 | ~ ~ | | | (in the following | | - | es) | | | | | | |
| | | | | time combined s | | M.Eng.); | | | | | | | |
| 9 | - | | grade for | the final grade | | | | | | | | | |
| l l | Dorcontor | | | | | | | | 161 000 | | | | |
| | rercentag | on the sui | m of credits of t | the graded | module | s accore | ling to RPO- | • MA §32 | | | | | |
| 0 | Module (| | | m of credits of t | the graded | module | s accorc | ling to RPO- | • MA §32 | | | | |

Required literature (in addition to the textbooks) will be announced each semester.

| Intell | ectual Pro | operty and Co | mpetition Law | | | | | | GRW | T | | |
|----------------|--|--|--|---|---|---|---|---|---|--|--|--|
| Identi numb | fication er: | Workload: | Credits: | Study | semeste | er: | Frequency offer | of the | Durat | ion: | | |
| 5007 | C 1. | 150 | 6 | 1st, 21 | nd or 3rd | l sem. | each seme | ster | 1 sem | | | |
| 1 | Course: | | Planned group s | sizes | Scope | | Actual c time / cla teaching | | Self-stu | ıdy | | |
| | Lecture | | 60 students | | 2 | SCH | 0 | h | 75 | h | | |
| | Tuition in seminars | | 30 students | | 0 | SCH | 0 | h | 0 | h | | |
| ŀ | Exercise | | 20 students | | 2 | SCH | 16 | h | 59 | h | | |
| | Practical | or seminar | 15 students | 0 | SCH | 0 | h | 0 | h | | | |
| | Supervised self-study | | 60 students | 60 students | | | 0 | h | 0 | h | | |
| 2 | After suc utility mo marks and of patent property a law again counteract | odel and trade r d can analyse i , design and t rights, in partic ast imitation. T et product and l on, they can dev | etion of the course, nark law, they know ndividual practical rademark infringer ular through licensi 'hey will be able to | w the orig cases, the ments and ing and ur o classify | ins, control by can ex- l the (p- nderstan- and eva | tents and valuate t ositive) d the con luate va | l legal effect he (negative possibilities mplementary rious metho | s of patent) prohibitions of exploint y protections ds (IP right | s, designs on rights in itation of n under co nt infringe | and trade n the case industria mpetitior ments) to | | |
| 3 | agreemen against in Effects of | nts on intellectunitation), licens f product pirac | nd employee inve al property, unfair of sing contract law. y and protective me re protection concep | competitio easures, | on law (s | upplem | entary comp | etition law | | | | |
| 4 | Forms of | teaching: | | | | | | | | | | |
| | - | | | udy, classroom sessions in the form of exercises | | | | | | | | |
| 5 | | tion requirement | nts: | | | | | | | | | |
| ļ | Formal: | - | | | | | | | | | | |
| | Content: | assessment: | | | | | | | | | | |
| 6 | | | tion or term paper | | | | | | | | | |
| 7 | Prerequis | ite for the awa | rd of credit points: | | | | | | | | | |
| 0 | | examination par | ss ile (in the following | r etudy or | Outome | ec) | | | | | | |
| 8 | | | art-time combined s | | | | al Engineer | ng and Ma | nagement | | | |
| | | | dies) (M.Eng.); | (N | п.шg.), | mausul | | | angement | | | |
| | Importan | ce of the grade | for the final grade: | | | | | | | | | |
| 9 | D (| | sum of credits of the | he graded | module | s accord | ling to RPO- | • MA §32 | | | | |
| 9 | Percentag | ge based on the | | ne gradea | module | | | | | | | |
| _ | Module (| Coordinator: | | | module | | | | | | | |
| 10 | Module O Prof. Dr. | Coordinator: Brunhilde Stee | | | module | | | | | | | |
| 9 10 11 | Module C Prof. Dr. Other info Benkard, Berlit, M Eckhardt | Coordinator: Brunhilde Stee ormation: Patentgesetz, arkenrecht, 10. /Klett (Hrsg.), | | en 2015. 2015. Gewerblie | | chtsschu | tz und Urhe | berrecht | | | | |

lage 2015.
Gausemeier/Glatz/Lindemann, Präventiver Produktschutz, München 2012.
Götting, Gewerblicher Rechtsschutz (Patent-, Gebrauchsmuster-, Design- und Markenrecht, 10. Auflage 2014.
Hering, Gewerblicher Rechtsschutz für Ingenieure, 2014. Haedicke (Hrsg.), Patentrecht, 3. Auflage 2015. Nordemann, Wettbewerbsrecht, Markenrecht, 11. Auflage, Baden Baden 2012.

| | dling Tech | nology and R | obotics | | | | | | HR | | | |
|------------------|--|--|---|--|--|--|----------------------|-----------------|------------|-----------|--|--|
| | tification ber: | Workload: | Credits: | Stud | y semeste | er: | Frequency offer | of the | Durati | ion: | | |
| 5009 |) | 150 | 6 | 1st, 2 | 2nd or 3rd | l sem. | annual winter sem | nester | 1 sem. | | | |
| 1 | Course: | - | Planned group | sizes | Scope | | Actual c | ontact time | Self-stu | ıdy | | |
| | | | | | | | / | | | | | |
| | Lecture | | 60 students | | 2 | SCH | classroon 0 | m teaching h | 75 | h | | |
| | - | n seminars | 30 students | | 0 | SCH | 0 | h | 0 | h | | |
| | i union i | ii semmars | 50 students | | 0 | SCII | 0 | 11 | 0 | 11 | | |
| | Exercise | | 20 students | | 1 | SCH | 8 | h | 51 | h | | |
| | Practical | or seminar | 15 students | | 1 | SCH | 16 | h | 0 | h | | |
| | | | | | | | | | | <u> </u> | | |
| | Supervis | ed self-study | 60 students | | 0 | SCH | 0 | h | 0 | h | | |
| 2 | Loorning | outcomes/com | natancas: | | -l | | | | | | | |
| | | i implement the ming a robotic s | presented algorith system. | ms for co | oordinate | transfor | rmation and | master the p | ractical a | ispects o | | |
| 3 | Contents | : | | | | | | | | | | |
| | 1. Manuf | facturing autom | ation | | | | | | | | | |
| | • | 1. Manufacturing automation Tasks, areas and functions | | | | | | | | | | |
| | Manually controlled handling machines | | | | | | | | | | | |
| | Programmable handling machines Use of handling equipment in assembly technology | | | | | | | | | | | |
| | 2. Roboti | | g equipment in ass | embry teo | chhology | | | | | | | |
| | 2. Robot | | of an industrial rol | bot | | | | | | | | |
| | • | Kinematics of | the robot | | | | | | | | | |
| | Kinemat | | | | | | | | | | | |
| | Robot kinematics | | | | | | | | | | | |
| | Coordinate transformation using homogeneous transformations | | | | | | | | | | | |
| | | te transformation | | | sformatic | ons | | | | | | |
| | The Den | ate transformation avit-Hartenberg | transformation | | | | .nsf.) | | | | | |
| | The Den | te transformatio avit-Hartenberg mations betwee Robot control a | transformation n robot and world and regulation | coordinat | | | nsf.) | | | | | |
| | The Den | tte transformation avit-Hartenberg mations betwee Robot control a Power transmission | transformation n robot and world and regulation ssion and drives for | coordinat | | | nsf.) | | | | | |
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| 4 | The Den Transfor | tte transformation avit-Hartenberg mations betwee Robot control a Power transmis Robot program Industrial robot | transformation n robot and world and regulation ssion and drives for | coordinat r robots | tes (back | | nsf.) | | _ | | | |
| 4 | The Dent Transform | tte transformation avit-Hartenberg mations betwee Robot control a Power transmis Robot program Industrial robot reaching: | transformation n robot and world and regulation ssion and drives for ming | coordinat r robots on examp | tes (backv | ward tra | | icals | | | | |
| | The Den Transfor Forms of Learning | tte transformation avit-Hartenberg mations betwee Robot control a Power transmis Robot program Industrial robot reaching: | transformation n robot and world of and regulation ssion and drives for ming t use and application tudy, classroom ev | coordinat r robots on examp | tes (backv | ward tra | | icals | | | | |
| | The Den Transfor Forms of Learning Participa Formal: | tte transformation avit-Hartenberg mations betwee Robot control a Power transmis Robot program Industrial robot reaching: units for self-st | transformation n robot and world of and regulation ssion and drives for ming t use and application tudy, classroom ev | coordinat r robots on examp | tes (backv | ward tra | | icals | | | | |
| 5 | The Den Transfor Forms of Learning Participa Formal: Content: | te transformation avit-Hartenberg mations betwee Robot control a Power transmis Robot program Industrial robot reaching: units for self-st tion requirement - - | transformation n robot and world of and regulation ssion and drives for ming t use and application tudy, classroom ev | coordinat r robots on examp | tes (backv | ward tra | | icals | | | | |
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| 5 | The Den Transfor Forms of Learning Participa Formal: Content: Forms of | te transformation avit-Hartenberg mations betwee Robot control a Power transmis Robot program Industrial robot teaching: units for self-st tion requirement - c - c assessment: | transformation n robot and world of and regulation ssion and drives for ming t use and application tudy, classroom ev | coordinat r robots on examp ents in th | tes (backy bles ne form o | ward tra | ses and pract | | | | | |
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| 5 | The Den Transfor Forms of Learning Participa Formal: Content: Forms of Written of Prerequise | tte transformation avit-Hartenberg mations betwee Robot control a Power transmis Robot program Industrial robot teaching: units for self-st tion requirement - cassessment: exam or combin | transformation n robot and world of and regulation ssion and drives for ming t use and application tudy, classroom ev ats: | coordinat r robots on examp ents in th | tes (backy bles ne form o | ward tra | ses and pract | | | | | |
| 5 6 7 | The Den Transfor Forms of Learning Participa Formal: Content: Forms of Written of Prerequis Module of Applicat | te transformation avit-Hartenberg mations betwee Robot control a Power transmis Robot program Industrial robot reaching: units for self-st tion requirement | transformation n robot and world of and regulation ssion and drives for ming t use and application tudy, classroom ev atts: ation exam (term p rd of credit points: ss le (in the following | coordinat r robots on examp ents in th paper with g study p | tes (backy bles he form or h present | f exercise ation an es) | ses and pract | | | | | |
| 4 5 7 8 | The Den Transfor Forms of Learning Participa Formal: Content: Forms of Written of Prerequis Module of Applicat | te transformation avit-Hartenberg mations betwee Robot control a Power transmis Robot program Industrial robot reaching: units for self-st tion requirement | transformation n robot and world of and regulation ssion and drives for ming t use and application tudy, classroom ev tts: ation exam (term p rd of credit points: ss le (in the following rt-time combined s | coordinat r robots on examp ents in th paper with g study p studies) (| tes (backy bles he form or h present | f exercise ation an es) | ses and pract | | | | | |
| 5 6 7 | The Den Transfor Forms of Learning Participa Formal: Content: Forms of Written of Prerequis Module of Applicat Applied Importan | te transformatio avit-Hartenberg mations betwee Robot control a Power transmis Robot program Industrial robot 'teaching: units for self-st tion requirement | transformation n robot and world of and regulation ssion and drives for ming t use and application tudy, classroom ev atts: ation exam (term p rd of credit points: ss le (in the following | coordinat r robots on examp ents in th paper with g study p studies) (| tes (back) bles he form of h present rogramm M.Eng.); | ward tra f exercis ation an es) | ses and pract |) | | | | |

| | Prof. Dr. Michael Leuer |
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| 11 | Other information: |
| | Required literature (in addition to the textbooks) will be announced each semester. |

| | strial Bus | Technology a | nd Communicati | on | | | | | IBK | |
|---------------|--|--|---|---|--|------------------------------------|--|------------|------------|-----------|
| denti numb | fication er: | Workload: | Credits: | Study | / semeste | er: | Frequency offer | of the | Durat | ion: |
| 5008 | | 150 | 6 | 1st, 2 | nd or 3r | d sem. | annual summer se | mester | 1 sem | |
| Į | Course: | | Planned group s | sizes | Scope | ; | actual Contact classroot teaching | | Self-stu | ıdy |
| | Lecture | | 60 students | | 2 | SCH | 0 | h | 75 | h |
| | Tuition in | n seminars | 30 students | | 0 | SCH | 0 | h | 0 | h |
| | Exercise | | 20 students | | 1 | SCH | 8 | h | 51 | h |
| | | or seminar | 15 students | | 1 | SCH | 16 | h | 0 | h |
| | Supervis | ed self-study | 60 students | | 0 | SCH | 0 | h | 0 | h |
| | They can | assess and select p and operate by | nts for determinist et industrial bus sys us systems. | | - | to their s | suitability ur | nder given | boundary o | condition |
| | Net Indi | Data link layer Transmission n EMC considera Real-time requi Connection of n work hierarchie Management / j IoT architecture ustrial bus syste Overview, appl Classic fieldbus Industrial Ether Industrial Wire systems in the CAN FlexRay LIN Pub/Sub instead OPC/UA TSN | rements / determin networks (repeater s process control / fi es ms ication and decision ses: Profibus, Inter met, focus on Ethe less automotive sector d of Client/Server MQTT, AMQP) n systems g | ess proceed , asymmo nism s, bridges eld / sens on-making bus-S, As | lures) etrical, fi s, routers sor-actua g aids | ibre opti , gatewa tor level | ıy) | | | |
| | | Performance an | | | | | | | | |

| | and practicals | |
|----|---------------------------------------|--|
| 5 | Participation requ | irements: |
| | Formal: | - |
| | Content: | - |
| 6 | Forms of assessme | ent: |
| | Written exam or c | combination exam (term paper with presentation and oral exam) |
| 7 | Prerequisite for th | e award of credit points: |
| | Module examination | ion pass and course assessment |
| 8 | Application of the | e module (in the following study programmes) |
| | Applied Automati time combined stu | on (part-time combined studies) (M.Eng.); Industrial Engineering and Management (part- udies) (M.Eng.); |
| 9 | Importance of the | grade for the final grade: |
| | Percentage based | on the sum of credits of the graded modules according to RPO- MA §32 |
| 10 | Module Coordinat | tor: |
| | N. N. | |
| 11 | Other information | : |
| | Required literature | e (in addition to the basic literature) will be announced each semester. |

| Con | oquium | | | | | | | | KLQ | |
|-----------------------|---|--|--|--|-----------------------------|-----------|------------------------------------|--|-----------|------------|
| Identi numb | ification | Workload: | Credits: | Study | semeste | er: | Frequency offer | of the | Durat | ion: |
| 5024 | | 100 | 4 | 4th se | m. | | each seme | ster | 1 sem | • |
| 1 | Course: | | Planned group siz | zes | Scope | | Actual c time / cla teaching | | Self-stu | ıdy |
| | Lecture | | 60 students | | 0 | SCH | 0 | h | 100 | h |
| | Tuition in | seminars | 30 students | | 0 | SCH | 0 | h | 0 | h |
| | Exercise | | 20 students | | 0 | SCH | 0 | h | 0 | h |
| | Practical | or seminar | 15 students | | 0 | SCH | 0 | h | 0 | h |
| | Supervise | ed self-study | 60 students | | 0 | SCH | 0 | h | 0 | h |
| 2 | its subjec justify the significan | t-related founda em independent ice for practice. | ident demonstrates (tions, its interdiscip ly. Students can crit | olinary co | onnectio | ons and i | ts extra-subj | ect-related | reference | s and to |
| 3 | The collo according | Contents: The colloquium complements the master thesis and is to be assessed independently. Content of the thesis according to the topic Defence of the procedure used in writing the thesis and questions that arose in the context of the work. | | | | | | | | |
| | Forms of teaching: | | | | | | | | • | |
| 4 | Forms of Oral exam | Ū, | | | • | | | | | • |
| 4 5 | Oral exam | Ū, | is: | | • | | | | | • |
| | Oral exam | nination ion requirement All m be suc | odules of the study ccessfully complete | d. | | | | | | |
| | Oral exam Participat Formal: Content: | nination ion requirement All m be suc Treats | odules of the study | d. | | | | | | |
| | Oral exam Participat Formal: Content: Forms of | nination ion requirement All m be su Treat assessment: | odules of the study ccessfully complete ment of the bachelo | d. r thesis | nme mus | | | | | |
| 5 | Oral exam Participat Formal: Content: Forms of Oral exam | nination ion requirement All m be su Treat assessment: nination for a m | odules of the study ccessfully complete ment of the bachelo aximum duration of | d. r thesis | nme mus | | | | | |
| 5 | Oral exam Participat Formal: Content: Forms of Oral exam | nination ion requirement All m be suc Treat assessment: nination for a m ite for the award | odules of the study ccessfully complete ment of the bachelo | d. r thesis | nme mus | | | | | |
| 5 6 7 | Oral exan Participat Formal: Content: Forms of Oral exan Prerequis Passed co | nination ion requirement All m be suc Treat: assessment: nination for a m ite for the award olloquium | odules of the study ccessfully complete ment of the bachelo aximum duration of | d. r thesis f 75 min | ame mus | st be suc | | | | |
| 5 | Oral exam Participat Formal: Content: Forms of Oral exam Prerequis Passed co Application | nination ion requirement All m be suc Treat: assessment: nination for a m ite for the award olloquium | odules of the study ccessfully complete ment of the bachelo aximum duration of d of credit points: e (in the following s | d. r thesis f 75 min study pro | utes | st be suc | cessfully co | mpleted. T | he master | thesis mus |
| 5 6 7 | Oral exan Participat Formal: Content: Forms of Oral exan Prerequis Passed co Applicati Applicat | nination ion requirement All m be suc Treat: assessment: nination for a m ite for the award olloquium | odules of the study ccessfully complete ment of the bachelo aximum duration of d of credit points: e (in the following st t-time combined stu | d. r thesis f 75 min study pro | utes | st be suc | cessfully co | mpleted. T | he master | thesis mus |
| 5 6 7 8 | Oral exan Participat Formal: Content: Forms of Oral exan Prerequis Passed co Applicati Applied A (part-time | nination ion requirement All m be suc Treat: assessment: nination for a m ite for the award illoquium on of the modul Automation (par e combined stud | odules of the study ccessfully complete ment of the bachelo aximum duration of d of credit points: e (in the following st t-time combined stu | d. r thesis f 75 min study pro | utes | st be suc | cessfully co | mpleted. T | he master | thesis mus |
| 5 6 7 8 | Oral exan Participat Formal: Content: Forms of Oral exan Prerequis Passed co Applicati Applied A (part-time Important | nination ion requirement All m be sur- Treat assessment: nination for a m ite for the award alloquium on of the modul Automation (par combined stud ce of the grade f | odules of the study ccessfully complete ment of the bachelo aximum duration of d of credit points: e (in the following st t-time combined stu ies) (M.Eng.); | d. r thesis f 75 min study pro udies) (N | utes ogramm (I.Eng.); | es) | cessfully co | mpleted. The second sec | he master | thesis mus |
| 5 6 7 | Oral exam Participat Formal: Content: Forms of Oral exam Prerequis Passed co Applicati Applied A (part-time Importance Percentag | nination ion requirement All m be sur- Treat assessment: nination for a m ite for the award alloquium on of the modul Automation (par combined stud ce of the grade f | odules of the study ccessfully complete ment of the bachelo aximum duration of d of credit points: e (in the following s t-time combined stu ies) (M.Eng.); for the final grade: | d. r thesis f 75 min study pro udies) (N | utes ogramm (I.Eng.); | es) | cessfully co | mpleted. The second sec | he master | thesis mus |
| 5 6 7 8 9 | Oral exan Participat Formal: Content: Forms of Oral exan Prerequis Passed cc Application Application Applied A (part-time Importance Percentag | nination ion requirement All m be suc Treat assessment: nination for a m ite for the award olloquium on of the modul Automation (par e combined stud ce of the grade f ge based on the suc Coordinator: | odules of the study ccessfully complete ment of the bachelo aximum duration of d of credit points: e (in the following s t-time combined stu ies) (M.Eng.); for the final grade: | d. r thesis f 75 min study pro udies) (N | utes ogramm (I.Eng.); | es) | cessfully co | mpleted. The second sec | he master | thesis mus |

| 1,1001 | er Thesis | | | | | | | | MAR | |
|-----------------------|---|---|--|--|---------------------------------|--|------------------------------------|-----------|-------------|-------|
| Identi numb | ification | Workload: | Credits: | Study | semeste | er: | Frequency offer | of the | Durat | ion: |
| 5023 | | 500 | 20 | 4th se | em. | | each seme | ster | 1 sem | |
| 1 | Course: | | Planned group si | izes | Scope | ; | Actual c time / cla teaching | | Self-stu | ıdy |
| | Lecture | | 60 students | | 0 | SCH | 0 | h | 500 | h |
| | Tuition in | seminars | 30 students | | 0 | SCH | 0 | h | 0 | h |
| | Exercise | | 20 students | | 0 | SCH | 0 | h | 0 | h |
| | Practical | or seminar | 15 students | | 0 | SCH | 0 | h | 0 | h |
| | Supervise | d self-study | 60 students | | 0 | SCH | 0 | h | 0 | h |
| 2 | After succ oriented ta | ask from his/h | tion of the master the er special subject are sciplinary contexts, | ea withir | a speci | fied perio | od of time, l | | | |
| 3 | Contents: The master thesis is an independent scientific work from the subject area of the respective study programme with a description and explanation of its solution. It can also be carried out through an empirical investigation or through conceptual or design tasks or through an evaluation of existing sources. A combination of these is possible. | | | | | | | | | |
| | • | - | esign tasks or throug | | | | | | | |
| 4 | Forms of | teaching: | | | | | | | | |
| | Forms of Written co | teaching: omposition wit | th faculty tutoring | | | | | | | |
| 4 5 | Forms of Written co Participat | teaching: omposition wit | th faculty tutoring | | | | | | | |
| | Forms of Written co Participat Formal: | teaching: omposition wit ion requirement | th faculty tutoring | gh an eva | lluation | of existin | ng sources | | | |
| 5 | Forms of Written co Participat Formal: Content: | teaching: omposition wir ion requiremen - Coor | th faculty tutoring | gh an eva | lluation | of existin | ng sources | | | |
| | Forms of Written co Participat Formal: Content: Forms of | teaching: omposition win ion requiremen - Coon assessment: | th faculty tutoring | gh an eva | lluation | of existin | ng sources | | | |
| 5 | Forms of Written co Participat Formal: Content: Forms of Master the | teaching: omposition win ion requiremen - Coor assessment: esis | th faculty tutoring nts: rdinated topic from t | gh an eva | lluation | of existin | ng sources | | | |
| 5 | Forms of Written co Participat Formal: Content: Forms of Master the Prerequisi | teaching: omposition with ion requirement - Coor assessment: esis ite for the away | th faculty tutoring nts: rdinated topic from rd of credit points: | gh an eva | lluation | of existin | ng sources | | | |
| 5 6 7 | Forms of Written co Participat Formal: Content: Forms of Master th Prerequise Module e | teaching: omposition witi ion requiremen - Coor assessment: esis ite for the away xamination pas | th faculty tutoring nts: rdinated topic from t rd of credit points: ss | gh an eva | nt's spec | of existin | ng sources | | | |
| 5 | Forms of Written co Participat Formal: Content: Forms of Master th Prerequis: Module e Applicatio | teaching: omposition witi ion requirement context ion requirement context context ite for the award context ite for the module context ite for the module | th faculty tutoring nts: rdinated topic from to rd of credit points: ss ile (in the following | gh an eva the stude | nt's spec | cial subjection (cial subjection) | ect area | A cômbina | tion of the | se is |
| 5 6 7 | Forms of Written co Participat Formal: Content: Forms of Master the Prerequise Module e Application Applied A | teaching: omposition wit ion requiremen con assessment: esis ite for the awar xamination par on of the modu Automation (par | th faculty tutoring nts: rdinated topic from t rd of credit points: ss ile (in the following urt-time combined st | gh an eva the stude | nt's spec | cial subjection (cial subjection) | ect area | A cômbina | tion of the | se is |
| 5 6 7 8 | Forms of Written co Participat Formal: Content: Forms of Master the Prerequise Module e Application Applied A (part-time | teaching: omposition with ion requirement con requirement con requirement con requirement con requirement con requirement con sthe modu Automation (page combined stu | th faculty tutoring nts: rdinated topic from to rd of credit points: ss ile (in the following | gh an eva the stude study pr tudies) (1 | nt's spec | cial subjection (cial subjection) | ect area | A cômbina | tion of the | se is |
| 5 6 7 8 | Forms of Written cc Participat Formal: Content: Forms of Master the Prerequiss Module e Application Applied A (part-time Importance | teaching: omposition witi ion requirement con requirement con requirement con assessment: esis ite for the award xamination parts on of the modu Automation (parts combined stur- ce of the grade | th faculty tutoring nts: rdinated topic from t rd of credit points: ss ile (in the following urt-time combined st dies) (M.Eng.); | the stude study pr tudies) (1 | nt's spee ogramm M.Eng.); | cial subjection (cial subjection) (cial subjecti | ect area | A combina | tion of the | se is |
| 5 6 7 | Forms of Written cc Participat Formal: Content: Forms of Master th Prerequis: Module e Application Applied A (part-time Importance percentag | teaching: omposition witi ion requirement con requirement con requirement con assessment: esis ite for the award xamination parts on of the modu Automation (parts combined stur- ce of the grade | th faculty tutoring nts: rdinated topic from t rd of credit points: ss tle (in the following art-time combined st dies) (M.Eng.); for the final grade: | the stude study pr tudies) (1 | nt's spee ogramm M.Eng.); | cial subjection (cial subjection) (cial subjecti | ect area | A combina | tion of the | se is |
| 5 6 7 8 9 | Forms of Written co Participat Formal: Content: Forms of Master th Prerequis: Module e Applied A (part-time Importand percentag | teaching: omposition witi ion requirement con requirement con assessment: esis ite for the away xamination pas on of the modu Automation (pas combined students) ce of the grade e based on the Coordinator: | th faculty tutoring nts: rdinated topic from t rd of credit points: ss tle (in the following art-time combined st dies) (M.Eng.); for the final grade: | the stude study pr tudies) (1 | nt's spee ogramm M.Eng.); | cial subjection (cial subjection) (cial subjecti | ect area | A combina | tion of the | se is |

| 2 | Course: Lecture Tuition in Exercise Practical of Supervised Learning of Students of simulation | or seminar d self-study outcomes/com can model and n tools. Studen | Credits: 6 Planned group s 60 students 30 students 20 students 15 students 60 students 60 students eptences: 1 analyse linear an ts can represent dy pare and interpret s | 1st, 2 | v semester nd or 3rd Scope 2 0 2 0 0 0 | l sem. | Frequency offer annual summer se Actual ce time / cla teaching 0 0 0 16 0 | emester ontact assroom | Durati 1 sem Self-stu 75 0 59 | • |
|---|--|---|---|---|--|--------------------------------|--|----------------------------------|--|-------------|
| 2 | Lecture Tuition in Exercise Practical of Supervised Learning of Students of simulation They will | seminars or seminar d self-study outcomes/com can model and n tools. Studen | Planned group s 60 students 30 students 20 students 15 students 60 students 9 10 11 12 13 14 14 15 15 16 17 17 18 19 10 10 10 10 11 12 <tr< th=""><th>sizes</th><th>Scope 2 0 2 0</th><th>SCH SCH SCH SCH</th><th>summer see Actual ce time / cla teaching 0 0 16</th><th>ontact assroom h h h</th><th>Self-stu 75 0</th><th>h h h</th></tr<> | sizes | Scope 2 0 2 0 | SCH SCH SCH SCH | summer see Actual ce time / cla teaching 0 0 16 | ontact assroom h h h | Self-stu 75 0 | h h h |
| 2 | Lecture Tuition in Exercise Practical of Supervised Learning of Students of simulation They will | or seminar d self-study outcomes/com can model and n tools. Studen | 60 students 30 students 20 students 15 students 60 students getences: 1 analyse linear an ts can represent dy | | 2 0 2 0 | SCH SCH SCH SCH | time / cla teaching 0 0 16 | h h h | 75 0 | h h |
| 2 | Tuition in Exercise Practical of Supervised Learning of Students of simulation They will | or seminar d self-study outcomes/com can model and n tools. Studen | 30 students 20 students 15 students 60 students petences: 1 analyse linear an ts can represent dy | d simple | 0 2 0 | SCH SCH SCH | 0 0 16 | h h h | 0 | h |
| 2 | Tuition in Exercise Practical of Supervised Learning of Students of simulation They will | or seminar d self-study outcomes/com can model and n tools. Studen | 30 students 20 students 15 students 60 students petences: 1 analyse linear an ts can represent dy | d simple | 0 2 0 | SCH SCH SCH | 0 | h h | 0 | h |
| 2 | Practical of Supervised Learning of Students of simulation They will | d self-study outcomes/com can model and 1 tools. Studen | 15 students 60 students petences: 1 analyse linear an ts can represent dy | id simple | 0 | SCH | | | 59 | h |
| 2 | Supervised Learning of Students of simulation They will | d self-study outcomes/com can model and 1 tools. Studen | 60 students petences: I analyse linear an ts can represent dy | d simple | _ | | 0 | h | | |
| 2 | Learning of Students of simulation They will | outcomes/com can model and 1 tools. Studen | petences: l analyse linear an ts can represent dy | d simple | 0 | NCH. | | | 0 | h |
| | Students c simulation They will | can model and tools. Studen | l analyse linear an ts can represent dy | d simple | | SCII | 0 | h | 0 | h |
| | 1. Modelli I F S 2. Simulat 2. Simulat 3. Simulat N N 4. Simulat S | introductory es Basic principle Model validation Structure of models Determination Approximation Frequency dom tion of continu Analogue simu Digital simulat Numerical stab Monte Carlo m MATLAB exaction of disconti System modell | echatronic systems of analytical mode a methods in the tin ain (continued frac ous systems ilation ion: Discretisation iilty, stiff systems iethod | ls through ne domain tion) and integ | n theoret n (detern ration m | ical and hination ethods | | | | |
| | • F • N | Replacement p MATLAB exa | roblems with uncer | rtain / cer | tain expe | ectations | | | | |
| | Forms of t Learning u | - | tudy, classroom ev | ents in the | e form o | f exercis | es and pract | icals | | |
| | Participati Formal: Content: | ion requiremer | its: | | | | | | | |
| | | assessment: | | | | | | | | |
| 0 | | | ation exam (term p | oaper with | n present | ation and | d oral exam) |) | | |
| | - | | d of credit points: | | | | | | | |
| | | | as and course assessed le (in the following | | ogramm | A () | | | | |
| | | | rt-time combined s | | - | | | | | |
| | | | for the final grade: | | | | | | | |

| | MA §32 |
|----|---|
| 10 | Module Coordinator: |
| | Prof. Dr. Michael Leuer |
| 11 | Other information: |
| | Required literature (in addition to the textbooks) will be announced each semester. |
| | |

| dentification | nd Innovation | Management | | | | | | INM | |
|---|---|---|---|--|--|--|---|--------------------------------------|-----------------|
| | Workload: | Credits: | Study s | semeste | er: | Frequency | of the | Durat | ion: |
| umber: 004 | 150 | 6 | 1st, 2nd | l or 3rd | l sem. | each seme | ster | 1 sem | |
| Course: | 100 | Planned group s | | Scope | | Actual co time / cla teaching | ontact | Self-stu | |
| Lecture | | 60 students | | 2 | SCH | 0 | h | 75 | h |
| Tuition | in seminars | 30 students | | 0 | SCH | 0 | h | 0 | h |
| Exercise | • | 20 students | | 2 | SCH | 16 | h | 59 | h |
| | l or seminar | 15 students | | 0 | SCH | 0 | h | 0 | h |
| Supervis | sed self-study | 60 students | | 0 | SCH | 0 | h | 0 | h |
| • | recognise the countries and t transfer their corporations a assess the diff | n in the corporate s different requirement o take them into act acquired understant nd internationally of ferences and intero- to define the prere | ents of com count in th nding of in operating m dependencie | npanies ne exect nnovat nedium es bety | for inne ution. ion mar -sized co ween tec | nagement in ompanies. chnology de | processes | s of multi | -nationa |
| for inno Instrume merging Carrying technolo | f the subject are vations, technolo ents of strategic market and tech g out market-orio gy and product g opportunities a s, competitor and | a (innovation and to ogy life cycles, etc.) and operational inn nology portfolio, e ented technology an strategies nd risks from the e alysis) and identify echnological capabi |) hovation ma etc.) nalyses and nvironment ing the stre | anagem I develo tal anal | nent (tech oping ma | hnology mat arket- and cu rly technolo | rix, techno istomer-or gy recogni | blogy portf iented tion, techn | čolio, ology |

| | Learning units for | self-study, classroom sessions in the form of exercises |
|----|---------------------|--|
| 5 | Participation requ | irements: |
| | Formal: | - |
| | Content: | - |
| 6 | Forms of assessme | ent: |
| | Written or oral ex | amination or presentation with paper |
| 7 | Prerequisite for th | e award of credit points: |
| | Module examination | ion pass |
| 8 | Application of the | module (in the following study programmes) |
| | Applied Automati | on (part-time combined studies) (M.Eng.); Industrial Engineering and Management (part- |
| | time combined stu | udies) (M.Eng.); |
| 9 | Importance of the | grade for the final grade: |
| | Percentage based | on the sum of credits of the graded modules according to RPO- MA §32 |
| | | |
| | | |
| 10 | Module Coordinat | |
| | U | f. h.c. Lothar Budde |
| 11 | Other information | : |
| | - | |

| | induted Au | tomation Syst | ems | | | | | | VA | |
|--------------|--|--|---|--|---|--|------------------------|---------------------------|-----------|------|
| dent numl | ification per: | Workload: | Credits: | Study | semeste | er: | Frequency offer | of the | Durati | ion: |
| 5003 | | 150 | 6 | 1st, 2nd or 3rd s | | d sem. | annual winter semester | | 1 sem | |
| l | Course: | - | Planned group s | sizes | Scope | ; ; | / | ontact time m teaching | Self-stu | ıdy |
| | Lecture | | 60 students | | 2 | SCH | 0 | h | 75 | h |
| | | n seminars | 30 students | | 0 | SCH | 0 | h | 0 | h |
| | Exercise | | 20 students | | 1 | SCH | 8 | h | 51 | h |
| | | or seminar | 15 students | | 1 | SCH | 16 | h | 0 | h |
| | Supervise | ed self-study | 60 students | | 0 | SCH | 0 | h | 0 | h |
| | diagnostic | c and prognostic | Knowledge of fau c means. Special e es students to very | mphasis i | s placed | on dece | ntralised an | d BUS-netw | orked sat | fety |
| | | | | | | | | | | |
| 3 | Contents: | | | | | | | | | |
| 3 | Linking d Design m Higher-le PDA and Central en | lecentralised au ethods for glob evel integration MDA in the pro- rror managemen | tomation compone al automation syste of shared transfer s oduction process; j nt with decentralise safety technology | ems systems a parts tracl ed recordi | king in c ing | ycle line | | | | |
| | Linking d Design m Higher-le PDA and Central er Decentral | lecentralised au tethods for glob evel integration MDA in the pre- rror management lised networked teaching: | al automation syste of shared transfer s oduction process; j nt with decentralise safety technology | ems systems a parts tracl ed recordi v (safety b | king in c ing us system | eycle line | es with dece | ntralised aut | | |
| 3 | Linking d Design m Higher-le PDA and Central er Decentral Forms of Learning | lecentralised au tethods for glob evel integration MDA in the pre- rror managemen lised networked teaching: units for self-st | al automation syste of shared transfer s oduction process; j nt with decentralise safety technology udy, classroom eve | ems systems a parts tracl ed recordi v (safety b | king in c ing us system | eycle line | es with dece | ntralised aut | | |
| 4 | Linking d Design m Higher-le PDA and Central er Decentral Forms of Learning Participat Formal: | lecentralised au tethods for glob evel integration MDA in the pre- rror management lised networked teaching: | al automation syste of shared transfer s oduction process; j nt with decentralise safety technology udy, classroom eve | ems systems a parts tracl ed recordi v (safety b | king in c ing us system | eycle line | es with dece | ntralised aut | | |
| 4 | Linking d Design m Higher-le PDA and Central er Decentral Forms of Learning Participat Formal: Content: | lecentralised au ethods for glob vel integration of MDA in the pro- rror managemen- lised networked teaching: units for self-st ion requiremen - - | al automation syste of shared transfer s oduction process; j nt with decentralise safety technology udy, classroom eve | ems systems a parts tracl ed recordi v (safety b | king in c ing us system | eycle line | es with dece | ntralised aut | | |
| 4 | Linking d Design m Higher-le PDA and Central er Decentral Forms of Learning Participat Formal: Content: Forms of | lecentralised au ethods for glob vel integration of MDA in the pro- rror managementised networked teaching: units for self-st ion requirementian - assessment: | al automation syste of shared transfer s oduction process; j nt with decentralise safety technology udy, classroom events: | ems systems a parts tracl ed recordi v (safety b | king in c ing us system | eycle line | es with dece | ntralised aut | | |
| 4 5 5 | Linking d Design m Higher-le PDA and Central er Decentral Forms of Learning Participat Formal: Content: Forms of Written er | lecentralised au ethods for glob vel integration of MDA in the pro- rror management lised networked teaching: units for self-st ion requirement - assessment: xamination or co | al automation syste of shared transfer s oduction process; j nt with decentralise safety technology udy, classroom events: | ems systems a parts tracl ed recordi v (safety b | king in c ing us system | eycle line | es with dece | ntralised aut | | |
| 4 5 5 | Linking d Design m Higher-le PDA and Central er Decentral Forms of Learning Participat Formal: Content: Forms of Written ex Prerequis | lecentralised au ethods for glob vel integration of MDA in the pre- rror managementised ised networked teaching: units for self-st ion requirementian - assessment: xamination or of ite for the award | al automation syste of shared transfer s oduction process; j nt with decentralise safety technology udy, classroom events: ts: | ems systems a parts tracl ed recordi v (safety b | king in c ing us system | eycle line | es with dece | ntralised aut | | |
| 4 5 7 | Linking d Design m Higher-le PDA and Central en Decentral Forms of Learning Participat Formal: Content: Forms of Written e Prerequis Module e | lecentralised au lethods for glob evel integration of MDA in the pro- rror managementised ised networked teaching: units for self-st ion requirementian - assessment: xamination or of ite for the award xamination pass | al automation syste of shared transfer s oduction process; j nt with decentralise safety technology udy, classroom events: | ems systems a parts tracl ed recordi (safety b ents in the | king in c ing us system e form o | rycle line ms) f exercis | es with dece | ntralised aut | | |
| 4 5 6 7 | Linking d Design m Higher-le PDA and Central er Decentral Forms of Learning Participat Formal: Content: Forms of Written er Prerequis Module e Application | lecentralised au tethods for glob vel integration MDA in the pre- ror management lised networked teaching: units for self-st ion requirement - assessment: xamination or co ite for the award xamination passion of the modul Automation (particular) | al automation syste of shared transfer s oduction process; p at with decentralise safety technology udy, classroom events: sele (in the following rt-time combined s | ems systems a parts tracl ed recordi (safety b ents in the g study pr | king in c ing us syster e form o ogramm | rycle line ms) f exercis | es with dece | icals | comation | |
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